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PRACTICE POINTER

Interpreting abnormal liver blood test results

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What you need to know

- Core liver blood tests have low sensitivity and specificity for diagnosing liver disease, so consider an abnormal result a prompt to use a more specific test
- Repeat a liver blood test only if you know the cause of the abnormality, and if you are not sure, establish the most likely cause first
- Abnormal liver blood test results rarely return to normal within one month
- Liver blood tests should not be interpreted in isolation, but used as part of a diagnostic pathway in conjunction with other investigations
- Risk and prognosis in liver disease are determined by cause, more than degree of liver blood test abnormality

A 58 year old man presents to his general practitioner (GP) to discuss recent blood test results after his annual review for hypertension. His medical history includes gout, chronic kidney disease stage G3a, prediabetes, and dyslipidaemia. His body mass index is 35. He takes ramipril 2.5 mg daily for hypertension and chronic kidney disease and rosuvastatin 10 mg daily for dyslipidaemia. He smokes five cigarettes a day and drinks three pints of beer each night. He works as a car salesman, and has not travelled overseas in the past two years.

Liver blood tests show alanine transaminase (ALT) 100 IU/L (normal range ~1-40), alkaline phosphatase (ALP) 58 IU/L (30-130), bilirubin 20 µmol/L (<21), albumin 39 g/L (35-50), estimated glomerular filtration rate 50 mL min/1.73m^2, total cholesterol 5.6, triglycerides 2.0 mmol/L, high density lipoprotein cholesterol 1.1, and low density lipoprotein cholesterol 3.4. Upon further questioning, the man reports no gastrointestinal symptoms and has pale urine and normal stools. Clinical examination reveals eyelid xanthelasma, a few chest wall spider naevi, abdominal obesity, and mild pedal oedema. He has no hepatosplenomegaly or jaundice.

Liver blood tests, frequently and inaccurately called liver function tests, are a collection of core and extended tests commonly requested in both primary and secondary care to screen for, diagnose, and monitor a broad range of liver diseases.[1] The core set of tests include ALT, aspartate aminotransferase (AST), ALP, bilirubin, albumin, and gamma-glutamyl transferase (GGT).[2] Additional initial tests to support assessment of liver health include full blood count (FBC) to measure platelets, and international normalised ratio (INR), followed by a standard and extended non-invasive liver aetiology tests (known informally as the "liver screen").[2]

With 21.7% of all liver blood tests in a large Scottish primary care cohort returning at least one abnormal result[1] (defined as a result outside of the local laboratory reference range), interpretation can be challenging. This stems from a low sensitivity or specificity of each individual liver blood test for detecting liver disease,[2] multiple indications for requesting,[3] and variations in the prevalence of liver disease and its risk factors by geography[3] (box 1). Furthermore, in primary care, clinicians are increasingly managing abnormal blood test results for patients they have never seen or directly cared for.[12] These factors can result in suboptimal management including unnecessary repeat testing and clinician inertia.[3] In an observational study of 95 977 patients in primary care in Scotland, only 50% of abnormal liver blood test results were followed up with subsequent investigations,[1] leading to missed opportunities for early detection and management of chronic liver disease and avoiding consequent complications.[3]

Box 1: Epidemiology of liver disease

Using pooled estimates from meta-analyses of global population studies, metabolic dysfunction-associated steatotic liver disease (MASLD, previously known as non-alcoholic fatty liver disease or fatty liver disease) is now the most prevalent cause (38%; 95% confidence interval 33.71 to 42.49) of chronic liver disease in adults globally.[4,5] Meta-analyses of population studies show that Europe has the highest prevalence of alcohol related liver disease at 5.4% (95% CI 3.9 to 7.1). Within Europe, the UK has the third highest prevalence (7.2%; 95% CI 3.0 to 13.0), behind Sweden (14.0%; 95% CI 13.0 to 15.0) and Italy (16.1%; 95% CI 1.2 to 43.3).[6] Both MASLD and alcohol-related liver disease fall under the umbrella of steatotic liver disease involving fat infiltration, followed by hepatic inflammation and fibrosis.[7]

Chronic viral hepatitis is an important diagnostic consideration in the context of managing abnormal liver blood tests. Data from the World Health Organization (WHO) show global hepatitis B prevalence of 3.8% (95% CI 3.0 to 5.0%) and hepatitis C prevalence of 0.8% (95% CI 0.6 to 1.0).[8] Data from WHO show hepatitis B virus is the leading cause of liver disease in China, India, and Nigeria.[9,10]

Globally, chronic liver disease and cirrhosis is the eighth most common cause of disability-adjusted life years lost in men and 19th most common cause in women[7]. After ischaemic heart disease, it is the second leading cause of years of working life lost in Europe.[11]

In this article, we propose an updated approach and algorithm to managing abnormal liver blood test results, underpinned by new evidence on the evolving epidemiology of chronic liver disease,[4,7,13] updated international guidelines on the management of

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metabolic dysfunction-associated steatotic liver disease (MASLD)[7] and steatohepatitis,[11] the evolving multiprofessional landscape within international primary care,[14] and a need to create an integrated approach to managing multisystem manifestations of metabolic disease.

How should I explain blood testing to a patient?

Before requesting liver blood tests, explain to the patient the indication for testing, such as "I am going to perform a simple liver blood test that will give us an overview of how your liver is working. An abnormal result won't necessarily tell us the cause of a liver problem but could help us decide what test to do next." When managing abnormal liver blood test results, we suggest discussing with patients the original indication for liver blood testing, the potential cause of abnormalities, the level of concern, and next steps as outlined in table 1.

Table 1 | Suggested focus of discussion, including rationale for measuring liver blood tests and example explanations

Focus of discussion	*Rationale*	*Example explanation*
Indication	Explain why the liver blood test is being done	*"As part of routine monitoring because you are taking methotrexate."* *"You had several non-specific symptoms which can be related to liver disease."* Or *"You have known scarring of your liver, so we conducted liver blood tests as part of annual monitoring."*
Cause	Explain whether the *cause* for the abnormal result is known or whether further tests are needed to determine the cause. You may want to share the pattern of abnormal results and how this informs the overall clinical picture and subsequent investigations	*"A raised ALT result is common in patients with diabetes and abnormal cholesterol results like yourself. It does not tell us the cause of your liver problem but it does suggest further investigations would be helpful."*
Level of concern	Explain your level of concern regarding the result and remember context is important— "normal results" (within the reference range) can also be abnormal in the context of liver disease, eg, normal ALT in liver cirrhosis.	*"Three of your liver blood tests are elevated and they were all normal when we last checked them three months ago. While we don't know the cause at this stage, I am concerned something serious is affecting your liver and we need to do further investigations urgently."*
Next steps	Explain to the patient if a specific action is required on their part and check they understand	*"Two of your liver blood tests are very high which is abnormal, and we need further urgent blood tests, please stop taking your statin medication and paracetamol and seek urgent medical help if you experience the following...."*

How should I manage abnormal liver blood test results?

The infographic shows our proposed algorithm for the management of abnormal liver blood tests in primary care, based on British Society of Gastroenterology guidelines for the management of abnormal liver blood test results,[2] the EASL-EASD-EASO Clinical Practice Guidelines on the management of MASLD published in 2024,[7] and global consensus recommendations for MASLD and MASH in 2025.[11] The algorithm comprises five stages.

Step 1: Initial clinical assessment

Step 1 reiterates the key information that supports clinicians in assessing for liver disease before serological testing and imaging. Assess hepatitis risk, pregnancy status, medication history, alcohol consumption, liver transplant history, risk factors for liver disease (metabolic syndrome, diabetes, overweight and obesity, family history of liver disease, iron overload), red flags for malignancy and acute illness.[2 7 15 16] Clinical examination includes looking for signs of acute and chronic liver disease. Liver disease red flags include falling albumin, substantially raised liver enzymes, jaundice, and signs and symptoms of malignancy.[2 7 17]

Alcohol history

Assess patients' quantity, frequency, and type of alcohol use irrespective of any blood test abnormalities.[18] Screen for alcohol use disorder using an internationally validated tool such as AUDIT-C (alcohol use disorders identification test-C).[18] A score of five points or more is a positive screen and should prompt completion of the full AUDIT questionnaire to assess for alcohol related harm; if alcohol dependence is suspected, assess severity using a more tailored and specific tool (eg, SADQ–severity of alcohol dependence questionnaire).[19] Where indicated, offer a brief intervention to help promote alcohol reduction and/or abstinence.[15 20]

Step 2: Initial liver health check

If you are managing an abnormal result and you do not know the patient, go back to step 1 to try to understand the clinical picture and indication for a liver blood test being requested. Indications include screening for liver disease in patients with non-specific symptoms, screening for liver disease in asymptomatic patients at high risk of liver disease, monitoring of hepatotoxic drugs (eg, disease modifying anti-rheumatic drugs,[21] amiodarone, isoniazid, methotrexate[22]), and monitoring of known liver disease or known risk factors for liver disease.[2]

Before requesting a liver blood test, be clear on the indication for doing so. They are non-specific tests and therefore best thought of as an initial liver health check owing to low sensitivity or specificity for individual liver diseases[2] and within-patient and between-patient variation.[23] Abnormal liver blood test results are signals for further testing. Results may follow either a specific pattern which indicates a particular cause of liver disease or a mixed pattern of liver disease.

When determining the pattern of abnormality consider the predominant pattern. Common patterns include:

- Isolated raised bilirubin—hyperbilirubinaemia
- Raised ALT and/or AST—hepatitic pattern
- Raised ALP and/or GGT—cholestatic pattern
- Low albumin

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- Raised INR (with or without jaundice)—synthetic failure or suspected malignancy pattern.

A mixed picture of initial liver blood test abnormalities requires correlation with findings from step 1 to help determine subsequent investigations. Following multiple avenues within step 3 of the algorithm may be necessary.

Step 3: Further testing to determine cause

Abnormality identified in step 2 requires further tests to investigate the hepatic or extra-hepatic cause.[2] Correlation with key clinical information from step 1 will shape differential diagnoses, eg, history of malabsorption, pregnancy status, born in countries where hepatitis B/C virus is prevalent, family history of haemochromatosis.[16] A raised mean corpuscular volume may indicate alcohol related liver disease but is not sensitive or specific for alcohol use.

In some regions of the UK there is a move towards automated reflex testing where laboratories conduct the most appropriate further tests based on the initial liver blood test abnormality.[3] Such a system specific to liver disease is called "intelligent liver blood testing" and was studied in a robust randomised controlled trial which increased specific liver disease diagnoses by 43% while being cost effective.[3]

Isolated bilirubin

Raised unconjugated bilirubin is most commonly caused by Gilbert's syndrome (a benign genetic variant) and less commonly by haemolysis.[24] In patients with a raised bilirubin, request fasting conjugated and unconjugated bilirubin, FBC, and blood film. Extremely raised unconjugated bilirubin may indicate the rare Crigler-Najjar syndrome, which presents mainly in childhood and requires referral to a hepatologist.[24 25]

What to do: If anaemia is present, check reticulocyte count and lactate dehydrogenase (LDH) to further assess for haemolysis. Raised conjugated bilirubin is most commonly due to obstructive biliary disease or parenchymal liver disease[2]; correlate with other liver blood tests.

Hepatitic pattern

Release of intracellular liver enzymes ALT and AST occurs with hepatocyte injury and death. Many disease processes and drugs cause a raised ALT and/or AST; as such, elevations in these enzymes are the most common liver blood test result abnormalities.[26] ALT has higher specificity for liver disease as it is found mainly in hepatocytes, whereas AST is found in hepatocytes to a lesser degree as well as skeletal and cardiac muscle.[2] The most common causes of raised ALT and/or AST include steatotic liver disease (which encompasses MASLD, alcohol related liver disease, and metabolic-dysfunction associated alcohol-related liver disease), viral hepatitis, autoimmune hepatitis, iron overload, and drug induced liver injury.[2 26]

What to do: To determine the cause of raised ALT and AST, request GGT, FBC, liver ultrasound, and a liver aetiology screen (hepatitis B virus surface antigen; hepatitis C virus antibody; auto-antibodies (anti-smooth muscle, antinuclear, anti-mitochondrial, and anti-neutrophil cytoplasmic antibodies); immunoglobulins; ferritin and transferrin saturation; and HbA1c).[2] Where alcohol related liver disease or fibrosis is suspected, calculate the De Ritis ratio (AST:ALT) where a ratio >1 indicates advanced fibrosis/cirrhosis.[2]

Cholestatic pattern

ALP is produced primarily in epithelial cells of the biliary system and in bone, and to a lesser degree in hepatocytes.[27] GGT is primarily produced in hepatocytes.[2] As GGT is not produced by bone, it is useful for differentiating raised ALP owing to liver/biliary disease (GGT raised). Although GGT is sometimes elevated in excess consumption of alcohol,[2 28] GGT is a not a reliable indicator of alcohol use.[28] Nevertheless, elevated GGT is an independent predictor of all-cause mortality risk (mildly elevated HR 1.84; CI 1.53 to 2.23; severely (≥ 2.5 × normal limit) elevated HR 6.64; CI 4.96 to 8.88)[1]. Common pathological causes of a cholestatic pattern include biliary obstruction (eg, gallstones, neoplasia), hepatic congestion (eg, secondary to right sided heart failure), drug induced liver injury, primary biliary cholangitis, and primary sclerosing cholangitis.[2] As vitamin D deficiency can cause raised ALP through compensatory mechanisms to maintain normal serum calcium, check vitamin D status for patients with an isolated raised ALP.[27]ALP typically rises during pregnancy due to placental production. During pregnancy, a rise in other liver blood tests in addition to ALP warrants investigation of worsening of pre-existing liver disease or potentially pregnancy related liver disease.

What to do: Request a liver ultrasound (to look for dilated bile ducts and/or focal liver lesions) and a liver aetiology screen.[2]

Synthetic failure/suspected malignancy

Synthetic failure refers to when the liver fails to produce sufficient proteins required for key bodily functions; this involves low albumin and prolonged INR.[2] This may also be associated with jaundice owing to decreased hepatic bilirubin breakdown and clearance and reduced urea owing to reduced processing of nitrogenous waste.[29 30] A similar pattern is also seen in a variety of malignancies with associated weight loss and symptoms of cholestasis (pruritis, jaundice, steatorrhoea). Oher causes of low albumin include acute phase response, malabsorption, malnutrition, haemodilution (pregnancy, heart failure, chronic kidney disease), protein loss from gut (protein losing enteropathy) and from kidneys (chronic kidney disease and nephrotic syndrome).[31]

What to do: Request an urgent liver ultrasound and refer urgently to a liver specialist when synthetic failure is suspected.[2] Where malignancy is suspected, refer according to most appropriate suspected cancer pathway.[2]

Mixed

A mixed pattern is common. For example, an older adult with reduced protein intake and heart failure may have low albumin (dilutional and reduced synthesis) and raised ALP and GGT owing to hepatic congestion.

What to do: Consider the key clinical information from step 1 alongside the predominant pattern of abnormality from step 2 to inform which further tests to determine cause of abnormal liver blood tests are needed in step 3.[2]

Steps 4 and 5: Diagnosis and management

Based on the clinical picture and test results from steps 2 and 3, clinicians might feel confident to diagnose and manage several of these conditions in primary care with appropriate support from specialists. In table 2, we outline common differentials, and an approach to diagnosis and management.

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Table 2 | Approach to diagnosis and management of common differential diagnoses of abnormal liver blood test results in primary care

Condition	Diagnosis	Management
Gilbert's Syndrome is a benign genetic variant that affects 5-10% of western European populations[32]	Diagnose Gilbert's syndrome when a patient has persistent unconjugated raised bilirubin with otherwise normal liver blood tests, no evidence of anaemia, and no other causes of liver disease[32]	Explain that Gilbert's syndrome is a benign condition and does not indicate liver disease; most patients are asymptomatic however some may experience intermittent jaundice which can appear in the context of acute bacterial and viral illness, alcohol consumption, stress, exercise, fasting, dehydration, and menstruation.[32] Explain jaundice resolves with removal of precipitant.[32] If jaundice is persistent, consider other causes and perform a liver aetiology screen.[2 32] Prescribe statins and fibrates with caution as they may be associated with increased risk of side effects.[32] Monitoring is not needed
Haemolysis results in increased hepatic bilirubin production.[33] Detecting and diagnosing haemolysis can cause confusion owing to different ways to classify haemolytic anaemia (by aetiology, pathophysiology, or Coomb's test (direct antiglobulin test) result)[33]	Diagnose haemolysis in the context of abnormal liver blood tests, if there is presence of anaemia and abnormal reticulocyte count and LDH[2]	Explain further tests and referral to a haematologist is required to investigate for haemolysis as the cause of raised unconjugated bilirubin. For further guidance on management of haemolytic anaemia see BMJ Best Practice: Haemolytic anaemia[34]
MASLD (part of steatotic liver disease) is an increasingly common cause of chronic liver disease in the UK and the most common cause globally—a hepatic manifestation of metabolic syndrome. It can lead to hepatic inflammation (referred to as metabolic-dysfunction associated steatohepatitis or metabolic dysfunction-associated steatohepatitis[7]) and is associated with increased risk of fibrosis/cirrhosis, cardiovascular and malignant disease[4]	Diagnose MASLD in patients with ultrasound or histological evidence of steatosis and at least one cardiometabolic risk factor (overweight or obesity, dysglycaemia or type 2 diabetes, raised triglycerides, low high density lipoprotein-c or on lipid lowering treatment, and hypertension or on treatment for hypertension)[7]	1. Manage the underlying diseases associated with MASLD 2. Assess and manage cardiovascular risk 3. Assess and monitor for progression of liver disease (fibrosis, cirrhosis, hepatocellular carcinoma).[7] Risk factor modification includes addressing cardiovascular risk factors, discussing the contribution and consequences of overweight and obesity to metabolic dysfunction associated steatotic liver disease, offering lipid lowering treatments, considering sodium glucose cotransporter-2 inhibitors to reduce cardiovascular risk in eligible patients (type 2 diabetes,[35] chronic kidney disease,[36] heart failure[37]), considering GLP-1 receptor agonists,[38] diet and lifestyle intervention advice, referring to weight management services where indicated, alcohol and smoking cessation advice.[4 7]
Alcohol related liver disease (part of steatotic liver disease): Alcohol consumption is the most common cause of liver disease and liver related deaths in the UK[18]	Diagnose alcohol related liver disease in patients with ultrasound or histological evidence of steatosis and, a) women consuming >50 g alcohol/day (~6.25 units/day or >35 units/week) or b) men consuming >60 g alcohol/day (~7.5 units/day or >50 units/week)[2]	1. Manage risk of liver injury by reducing alcohol consumption in a structured way, with a goal of complete abstinence from alcohol (this may need support of specialist services to prevent or manage alcohol withdrawal syndrome) 2. Assess risk of liver fibrosis and risk of progression of chronic liver disease with a view to preventing complications 3. Manage associated cardiovascular and malignant risk[15 39 40] 4. Explain to patients that not only is alcohol harmful to the liver but is a major source of excess calories which increases risk of overweight/obesity Assess for fibrosis in primary care using a non-invasive fibrosis tool (such as enhanced liver fibrosis test or FIB-4).[2 40] In alcohol related liver disease, ALT and/or AST measurement is not a reliable indicator of liver fibrosis—refer patients directly for transient elastography.[41] Consider prescribing thiamine to reduce risk of irreversible neurological damage,[19] and refer to alcohol addiction services.[19] Refer to a hepatologist for assessment of liver disease, and for screening and treatment of portal hypertension and hepatocellular carcinoma[21]
Metabolic and alcohol-associated liver disease (part of steatotic liver disease) is a new name within the umbrella of steatotic liver disease—liver steatosis and metabolic dysfunction associated with calorie excess and habitual (rather than dependent) alcohol consumption	Diagnose metabolic and alcohol associated liver disease in patients with evidence of liver steatosis and, a) women consuming 20-50 g/day (~2.5-6.25 units/day or ~17.5-44.5 units/week) or b) men consuming 30-60 g/day (~3.75-7.5 units/day or ~26.25-52.5 units/week)[7]	
Synthetic failure/suspected malignancy: Synthetic failure is a component of liver failure, specifically the impaired ability to produce key proteins required for a range of normal physiological functions.[2] Suspected malignancy may result from primary hepatocellular carcinoma or malignancy with hepatic invasion causing cholestasis	Diagnose synthetic failure in patients with low albumin, raised INR and/or jaundice.[2] Marked cholestasis, jaundice, and weight loss suggest possible hepatocellular carcinoma or malignancy with hepatic infiltration.[2] Thrombocytopenia is also a common complication of chronic liver disease[42]	Arrange urgent liver ultrasound for patients with suspected synthetic failure and refer urgently to a hepatologist for further management, or where clinically indicated arrange urgent hospital admission.[2] For suspected malignancy, refer to the most appropriate urgent cancer specialist
Unclear cause: While not a diagnosis, this is a useful label for primary care clinicians to use in the diagnostic process of determining the cause of abnormal liver blood tests and can be used in referral to specialists	Diagnose "unclear cause" when LBTs remain abnormal despite normal liver ultrasound and liver aetiology screen	Refer to a hepatologist for further management

LDH=lactate dehydrogenase; MASLD=metabolic dysfunction-associated steatotic liver disease; FIB-4= fibrosis-4 index for liver fibrosis; ALT= alanine transaminase; AST= aspartate aminotransferase; INR= international normalised ratio; LBT=liver blood test.

Assessing liver fibrosis

Patients with metabolic disease and those with signs of steatotic liver disease should undergo non-invasive assessment of liver fibrosis.[7] The most widely available method in primary care is using the FIB-4 (fibrosis-4 index for liver fibrosis) score which calculates a fibrosis risk score based on age, AST, ALT, and platelet count.

- For patients with a score <1.3, FIB-4 has a high negative predictive value for advanced fibrosis and their FIB-4 score should be reassessed every 1-3 years.[7]
- For patients with an intermediate score of 1.3-2.67, intensify primary care management of comorbidities and consider

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additional assessment of liver fibrosis using local resources (non-alcoholic fatty liver disease fibrosis score, vibration controlled transient elastography—fibroscan, shear wave elastography, magnetic resonance elastography, enhanced liver fibrosis test).[7]

- For patients with a score >2.67, intensify primary care and specialist management of comorbidities and refer to hepatology for further liver fibrosis assessment.[7]
- Limitations of FIB-4: A FIB-4 score <1.3 has a high negative predictive value FIB-4 has reduced predictive power in adults aged over 65 and under 35, intermediate scores (1.3-2.67), and in patients with type 2 diabetes, therefore consider alternative measures of liver fibrosis for these cohorts. FIB-4 may still be used for patients aged over 65 where intermediate range is defined as 1.30-2.0 and referral to hepatology is warranted for scores >2.0.[7]

Multidisciplinary management of chronic liver disease

After initial diagnosis and management of chronic liver disease and its cause, invite patients to a review of chronic disease status on an annual basis, or more frequently depending on the degree of liver disease.[41] Chronic liver disease benefits from a multidisciplinary team approach.

At an annual review, general practitioners, nurse practitioners, or liver specialists should[7 11 15 41 43 44]

- Inquire about new and existing symptoms of chronic liver disease
- Conduct clinical examination to ascertain signs of decompensation (encephalopathy, ascites, muscle loss)
- Monitor liver blood tests (ALT, ALP, bilirubin, albumin, and INR)
- Assess alcohol consumption and advise accordingly
- Monitor for liver fibrosis dependent on presence or degree of fibrosis
- Manage cardiovascular risk by addressing pre-existing cardiometabolic risk factors (eg, diabetes, hypertension, dyslipidaemia)
- Offer lipid lowering therapy tailored to individual patient needs.[2 45] Statins can be prescribed in patients with raised ALT and/or AST <3 times upper limit of normal range.[46] Statins are associated with improved hepatic inflammation, steatosis, and fibrosis.[41]

Refer to the following health professionals as required:

- Pharmacist for a thorough medication review where concerns exist regarding drug induced liver injury
- Dietitian for patients with specific dietary needs (eg, coeliac disease) and where possible for dietary guidance regarding weight loss
- Weight management services for specialist weight loss interventions, eg, glucagon like peptide-1 agonists
- Mental health services for coexisting mental health disorders that are common in alcohol use disorders, and alcohol specialist services for patients with alcohol use disorder and alcohol related liver disease.

Refer to a hepatologist or gastroenterologist with an interest in liver disease in the following scenarios[2 19]:

- Patients who present acutely unwell with risk factors for liver disease and who have signs and symptoms of liver disease in clinical history and examination[2] This may include patients with suspicion of acute hepatitis, drug induced liver injury, synthetic failure, and decompensated liver failure.[2]
- Abnormal liver investigation results indicating specific liver disease—patients who have abnormal liver blood test results with positive aetiology screening test results that indicate a specific liver diagnosis, eg, raised ALT and suspected hepatic iron overload.[16]
- Abnormal liver investigation results indicating chronic liver disease—patients who have abnormal liver blood test results with aetiology screening tests showing chronic liver disease such as when liver blood test results are markedly abnormal (≥2.5 × the upper limit of normal range), where a patient has evidence of fibrosis on a liver ultrasound or is high risk of fibrosis on a non-invasive liver test (eg, FIB-4), when red flags for malignancy are present, synthetic function failure, negative extended liver panel in primary care but core panel liver blood test results remain abnormal, or when the diagnosis is unclear.[2] When red flags for malignancy are present, consider the most appropriate specialist for referral depending on the clinical picture.

Case continued

You arrange additional blood tests alongside a liver ultrasound scan. Blood test results show platelets 120 (140–400×10^9/L), AST 60 (1-45 IU/L), ALT 100, HbA1c 46 (<42 mmol/mol). Ferritin, transferrin saturation, autoantibodies, immunoglobulins, and hepatitis B/C are all within normal range. Liver ultrasound shows evidence of fatty liver. You calculate the FIB-4 score as 3.03 which correlates with moderate risk of fibrosis. You diagnose MASLD and discuss with the patient an approach to managing metabolic syndrome and MASLD.

Education into practice

- When interpreting an abnormal liver blood test result, how often are you aware of the indication for testing?
- How often do you assess for the presence of fibrosis in patients with raised ALT or AST?
- How do you explain to patients with MASLD that they have an increased risk of cardiovascular and malignant disease and manage this accordingly?

How patients were involved in the creation of this article

We are grateful to a patient who experienced acute liver failure and received a liver transplant and who shaped this article by helping to refine sections related to how we describe results to patients.

Future recommendations for research

- Further measure the impact of intelligent liver blood testing in primary care[3]
- Re-analysing laboratory parameters excluding MASLD populations could more accurately determine true reference ranges for liver enzymes
- Examine the direct and indirect effects of GLP-1 agonists on liver health and on behaviour change interventions to address the two most common causes of liver disease: alcohol and calorie excess.

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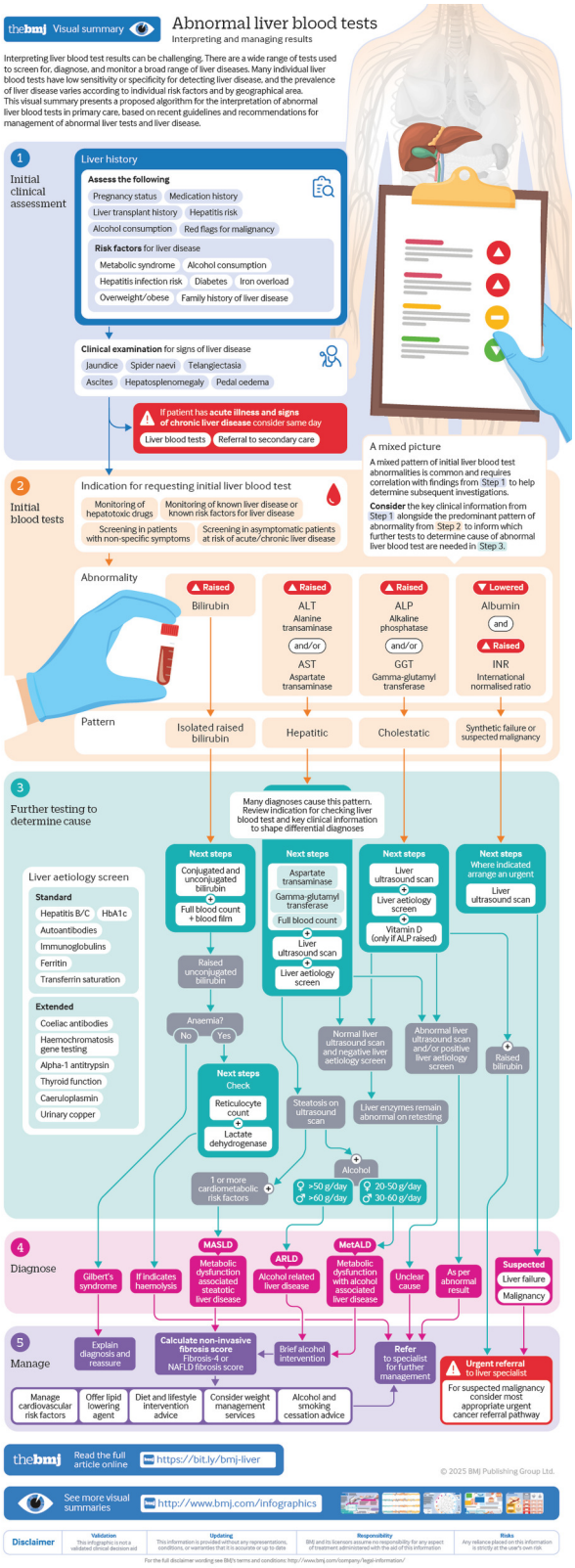
thebmj Visual summary
Abnormal liver blood tests
Interpreting and managing results
Interpreting liver blood test results can be challenging. There are a wide range of tests used to screen for, diagnose, and monitor a broad range of liver diseases. Many individual liver blood tests have low sensitivity or specificity for detecting liver disease, and the prevalence of liver disease varies according to individual risk factors and by geographical area. This visual summary presents a proposed algorithm for the interpretation of abnormal liver blood tests in primary care, based on recent guidelines and recommendations for management of abnormal liver tests and liver disease.
1 Initial clinical assessment
Liver history
Assess the following
Pregnancy status
Medication history
Liver transplant history
Hepatitis risk
Alcohol consumption
Red flags for malignancy
Risk factors for liver disease
Metabolic syndrome
Alcohol consumption
Hepatitis infection risk
Diabetes
Iron overload
Overweight/obese
Family history of liver disease
Clinical examination for signs of liver disease
Jaundice
Spider naevi
Telangiectasia
Ascites
Hepatosplenomegaly
Pedal oedema
If patient has acute illness and signs of chronic liver disease consider same day
Liver blood tests
Referral to secondary care
A mixed picture
A mixed pattern of initial liver blood test abnormalities is common and requires correlation with findings from Step 1 to help determine subsequent investigations.
Consider the key clinical information from Step 1 alongside the predominant pattern of abnormality from Step 2 to inform which further tests to determine cause of abnormal liver blood test are needed in Step 3.
2 Initial blood tests
Indication for requesting initial liver blood test
Monitoring of hepatotoxic drugs
Monitoring of known liver disease or known risk factors for liver disease
Screening in patients with non-specific symptoms
Screening in asymptomatic patients at risk of acute/chronic liver disease
Abnormality
Raised
Bilirubin
Raised
ALT
Alanine transaminase
and/or
AST
Aspartate transaminase
Raised
ALP
Alkaline phosphatase
and/or
GGT
Gamma-glutamyl transferase
Lowered
Albumin
and
Raised
INR
International normalised ratio
Pattern
Isolated raised bilirubin
Hepatitic
Cholestatic
Synthetic failure or suspected malignancy
3 Further testing to determine cause
Many diagnoses cause this pattern. Review indication for checking liver blood test and key clinical information to shape differential diagnoses
Liver aetiology screen
Standard
Hepatitis B/C
HbA1c
Autoantibodies
Immunoglobulins
Ferritin
Transferrin saturation
Extended
Coeliac antibodies
Haemochromatosis gene testing
Alpha-1 antitrypsin
Thyroid function
Caeruloplasmin
Urinary copper
Next steps
Conjugated and unconjugated bilirubin
Full blood count + blood film
Raised unconjugated bilirubin
Anaemia?
No
Yes
Next steps
Check
Reticulocyte count
Lactate dehydrogenase
Next steps
Aspartate transaminase
Gamma-glutamyl transferase
Full blood count
Liver ultrasound scan
Liver aetiology screen
Next steps
Liver ultrasound scan
Liver aetiology screen
Vitamin D (only if ALP raised)
Next steps
Where indicated arrange an urgent
Liver ultrasound scan
Normal liver ultrasound scan and negative liver aetiology screen
Abnormal liver ultrasound scan and/or positive liver aetiology screen
Raised bilirubin
Steatosis on ultrasound scan
Liver enzymes remain abnormal on retesting
Alcohol
1 or more cardiometabolic risk factors
>50 g/day
>60 g/day
20-50 g/day
30-60 g/day
4 Diagnose
Gilbert's syndrome
If indicates haemolysis
MASLD
Metabolic dysfunction associated steatotic liver disease
ARLD
Alcohol related liver disease
MetALD
Metabolic dysfunction with alcohol associated liver disease
Unclear cause
As per abnormal result
Suspected
Liver failure
Malignancy
5 Manage
Explain diagnosis and reassure
Calculate non-invasive fibrosis score
Fibrosis-4 or NAFLD fibrosis score
Brief alcohol intervention
Refer to specialist for further management
Urgent referral to liver specialist
For suspected malignancy consider most appropriate urgent cancer referral pathway
Manage cardiovascular risk factors
Offer lipid lowering agent
Diet and lifestyle intervention advice
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